

Microstructure and Optical Properties Characterization of Polymeric Materials

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The durability and appearance of polymeric materials and coating systems depend on the final microstructure/morphology that is achieved. This research area focuses on characterizing the nano-/micro-domains, nano-structural features, and surface morphology using novel microscopy (atomic force microscopy and laser confocal microscopy) and high-resolution scattering (static and dynamic light scattering, small angle neutron scattering, and small and wide angle X-ray scattering) techniques. The state of dispersion and flocculation, particle-particle interactions, and aggregation effects in the pigmentary and nano-particle filled polymeric systems in solid and liquid states can be characterized, and the results will be related to durability and optical properties (color and gloss) of the system. Current research efforts includes (1) developing non-destructive, direct, and efficient methods to characterize microstructure and pigment dispersion in highly scattered and turbid polymeric coating system, (2) implementing a methodology linking the microstructure to the durability and optical properties by integrating measurements and modeling.